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FOUR BURROWING LYCOSA (*GEOLYCOSA* MONTG. *SCAPTOCOSA* BANKS) INCLUDING ONE NEW SPECIES.

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In Psyche, Vol. 2, 1877, S. H. Scudder described the burrowing spider of the Atlantic seacoast under the name *Lycosa arenicola*, which was preoccupied by Cambridge in the "Spiders of Dorset" in 1875. It was again described by George Marx in the American Naturalist in 1881 as *Lycosa pikei*. The upland species of

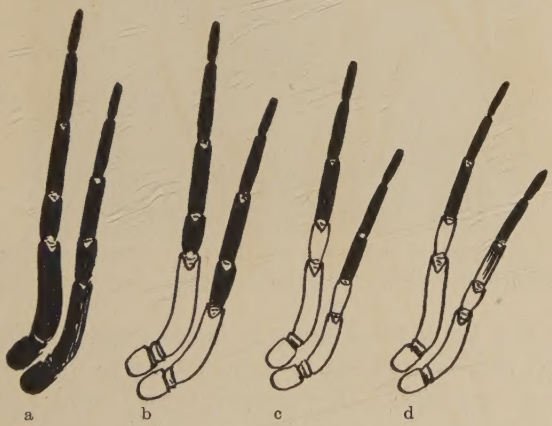

Fig. 1. First and second legs; a, *pikei*, b, *nidifex*, c, *missouriensis*, d, *wrightii*.

the Eastern States was described by Marx at the same time with the name *Lycosa nidifex*. *Lycosa missouriensis* was described by Nathan Banks in Entomological News, 1895, and again under the name *domifex* by J. L. Hancock in Entomological News, 1899. The fourth species which is described here, *Lycosa wrightii*, has long been known without any name or description being published.

This group is distinguished, as mentioned by Banks in his description of Scaptocosa in Journ. N. Y. Ent. Soc., 1904, by the absence, in females only, of spines on the upper side of tibia III and IV and by definite black markings on the under side of legs I and II in both sexes. In *pikei* the black extends the whole length of legs I and II including the coxæ. In *nidifex* it covers four terminal joints. In *missouriensis* it covers three terminal joints and in *wrightii* three joints of leg I and two and part of the third of leg II. Fig 1. In this group the first leg is proportionally thicker in both sexes than in the other Lycosidæ. In the

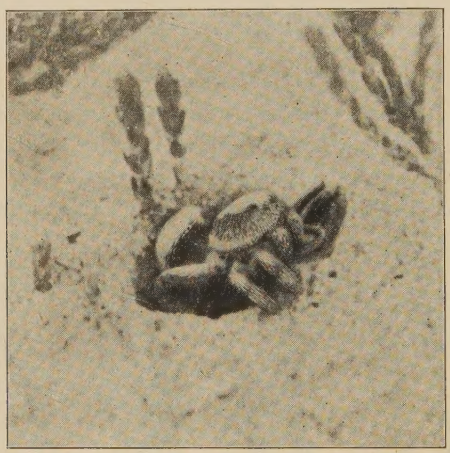

Fig. 2. *Lycosa pikei* sitting in the mouth of its burrow waiting for insects to come within reach.

males the first leg is three times at long as the cephalothorax in *nidifex* and *wrightii* and two and three-fourths times as long in *missouriensis* and *pikei*. In females it is two and a half times as long in *nidifex*, two and a quarter in *wrightii*, two and a fifth in pikei and twice in *missouriensis*.

L. *pikei* lives in sandy country near the seashore from Maine to New Jersey; *L. nidifex* along the eastern coast from Maine to Georgia and westward as far as Albany, N. Y., and Atlanta, Ga.; *missouriensis* along the Great Lakes in Ohio, Indiana and Illinois and south to Missouri and North Carolina; *L. wrightii* in sandy country along the Lakes from the eastern end

of Lake Erie near Buffalo to Chicago, Ill., and south to the middle of Illinois, along the Illinois River.

In this group the burrowing habit is so far developed that, excepting adult males during the mating season, their whole life is passed under ground or within a short distance of the mouth of the burrow. As soon as the young leave their mother they make burrows of their own proportioned to their size. The digging is done by covering the sand with silk enough to hold the grains together and it is then gathered into pellets of convenient size and carried in the mandibles to the mouth of the burrow, where

Fig. 3. *Lycosa nidifex* sitting in the mouth of its burrow.

it is thrown outward by the ends of the front feet and on open sand the pellets may be seen in a circle of three or four inches radius around the hole. When watching for prey, they sit with the front half of the body out over the edge of the hole and the legs turned under. Fig. 2. They are sensitive to the slightest movements on the ground, and when down in their burrows will notice the walking of an insect within an inch or two of the hole and come quickly to the top. The movement of a straw on the surface will sometimes deceive them and bring them to the mouth of the hole.

Lycosa nidifex digs often in sod and makes a "turret" around

the mouth of the burrow, sometimes only a narrow ring of dead grass, but often rising an inch or more above the surface of the ground and covered with straw, chips or any fine, loose material within reach. When watching, the spider sits in the top of the turret. Fig. 3. *L. missouriensis* also habitually makes a turret, low or high, according to the material and surroundings. Fig 4. *L. pikei* makes no turret except a slight ring where there is much loose material blowing near the hole. Fig. 2. In open sand it

Fig. 4. Mouth of burrow of *Lycosa missouriensis* surrounded by grass and leaves of bearberry, Buffington, Indiana.

sometimes makes a flat collar of silk over the surface an inch wide around the hole. *L. wrightii* also prefers to dig in open sand and makes no turret or only a rudiment of one.

L. nidifex matures in May, the other species in August and September. The males all die before winter. Both sexes of all the species pass the winter half grown. In *nidifex* they mature early enough to lay their eggs the next summer but the other species do not mature until late and the fertilized females live over a sec-

ond winter and lay eggs in May or June. The burrows are not closed during the winter except as the weather accidentally flattens the lining around their mouths and makes the opening smaller. The spiders remain torpid at the bottom, unhurt by the freezing of the soil around them

Lycosa pikei Marx.

Pl. 4, Figs. 1, 1a, 1b, 1c.

Lycosa arenicola, Scudder, PSYCHE, Vol. II, 1877.
Lycosa pikei, Marx, American Naturalist, 1881.
Lycosa nidifex, Emerton, N. E. Lycosidæ, Trans. Conn. Acad., 1885.
Lycosa pikei, Emerton, Supplement to N. E. Spiders, Trans. Conn. Acad., 1909.

The name *arenicola* was preoccupied by O. P. Cambridge in the "Spiders of Dorset," 1875. In Trans. Conn. Acad., 1885, I have confounded this species with *L. nidifex* and the description given there applies in part to both species. This mistake has been continued by T. H. Montgomery in Proc. Acad. Nat. Sci., Philadelphia, 1904, and by R. V. Chamberlin in Proc. Acad. Nat. Sci., Philadelphia, 1908. The differences between this species and *nidifex* are described in my supplement to N. E. Spiders, Trans. Conn. Acad., 1909. *Lycosa arenicola* McCook refers to this species in his accounts of habits on the Massachusetts coast, but he also applies the name *arenicola* to "the turret spider," and so probably includes *nidifex* and perhaps other species.

Lycosa pikei is distinguished from *nidifex* by its color, which is darker toward the front, and the distinct middle stripe on the abdomen. The legs are also slightly shorter. These differences are more distinct in the males and less so in old females and young. The cephalothorax in females is dark gray with a lighter middle stripe. The first and second legs are colored like the cephalothorax with the first pair a little the darker. The third and fourth legs are lighter gray more like the light stripe of the cephalothorax. The abdomen is light gray with a slightly darker middle band extending its whole length, the front end following the outline of the dorsal vessel and the hinder half a little wider with the sides notched. On the under side the legs I and II are black their whole length, and the sternum is black, at least at the front end. The abdomen is pale with usually, but not always, a gray stripe in the middle for the whole or part of its length. The sides of

the abdomen are black and sometimes in young individuals the middle and side stripes unite and the whole under surface is as black as in *wrightii*.

In males the upper side is all light gray, the front legs only a little darker than the third and fourth. The front of the mandibles is more brightly orange, with sometimes a little orange around the eyes, and there is a bright orange marking bordered with black in the middle of the abdomen. The light middle stripe of the cephalothorax is bordered by black markings radiating toward the sides, the most conspicuous marks ending at the two upper eyes. On the under side the markings are like those of the female, with still stronger contrast between the light and dark parts.

The length of the cephalothorax of the female is 9 mm., of the male 8 mm. Leg I of female 20 mm., of male 22 mm.

The holes are usually in clear sand, but where the spiders are numerous they dig on high land among low plants, and sometimes even in pastures where there is a thick sod. They make no "turret" around the mouth of the hole, but where they dig among loose rubbish, a few pieces may be sometimes fastened to the lining around the mouth. A flat collar on the sand is sometimes made around the hole. The spider sits out on the edge of its hole when looking for prey with feet I and II turned under the thorax, as shown in Fig. 2. Insects are noticed within six or eight inches and the spider rushes for them, returning quickly to the hole.

Freshly molted males and females are found in their holes in August and the males wander about on the surface through that month and September. The pairing was once seen at the mouth of the hole. The female sat out of the hole with her feet under her as usual, while the male approached very slowly, holding his first legs above his head and alternately moving them slowly forward and drawing them quickly back until he was within the female's reach, when she came out toward him and after a show of defence, allowed him to step over her and grasp her around the cephalothorax as usual in the Lycosidæ. The eggs are laid the next spring in May and June. The young remain a long time with the mother, in one case as late as September.

This species lives from Old Orchard Beach, Maine, to Sandy Hook, New Jersey, but never far from the seashore. It is espe-

cially abundant in the sandy hills of Cape Cod, Mass., and in the dunes from Cape Ann north to Plum Island. The spiders described by Marx were from Long Island, New York, where it is abundant.

Lycosa nidifex Marx

Pl. 4, Figs. 2, 2a, 2b, 2c.

American Naturalist, 1881.

This species has for the most part been confounded with *L. pikei*. In 1870 I described in the American Naturalist the holes of this spider with their large turrets at the mouth covered with grass and leaves, but found at that time only immature spiders which I did not distinguish from *L. pikei*, which I afterward found at the seashore. In my own writings and in those of McCook, Montgomery and Chamberlin, *Lycosa arenicola* or *nidifex* has included both species. Marx left no type specimens, but in his collection now at the U. S. National Museum are spiders of this species taken in the neighborhood of Washington and no doubt the ones used by Marx at the time he described *Lycosa nidifex*.

The color of the female is dark gray modified by lighter hairs, with very little difference between the front and hind legs and anterior and posterior parts of the body. The cephalothorax has a lighter middle stripe and the abdomen has a dark middle stripe following at the front end the shape of the dorsal vessel, at the sides of which the abdomen is lightened by paler or yellowish hairs. On the under side the legs I and II have the four terminal joints black, the femora and the other legs gray with light hairs. The coxæ, sternum and maxillæ are also gray, a little darker than the legs. The under side of the abdomen is pale with a dark middle band and dark sides and spinnerets, the width of the dark band is variable and in some individuals appears to cover the whole abdomen with dark color.

The male is light gray, when freshly molted varying from bluish gray to flesh color. The middle stripe of the cephalothorax is bordered with black, broken into radiating dark lines extending forward beyond the upper eyes. On the abdomen there is a distinct dark mark over the dorsal vessel and a less distinct and wider stripe extending back to the spinnerets. The mandibles have more orange hairs than in the female and in some individuals the

markings of the back are partly outlined with orange yellow hairs. The under side has the same light gray color with black markings like those of the female.

This species is longer legged in both sexes than *L. pikei*. The cephalothorax of a female and of a large male measures 9 mm. Leg I of female 24 mm. and Leg I of male 27 mm.

L. nidifex digs its holes in open fields, often through sod several inches thick and covered with growing grass and other low plants. It is most abundant in sandy regions but sometimes digs in hard gravel. It makes usually a so-called "turret" around the mouth

Fig. 5. Mouth of burrow of *L. nidifex* surrounded by pieces of decayed wood, Waltham, Mass.

of its hole, sometimes a low ring of straw or chips attached to the edge of the lining of the burrow and sometimes rising an inch or more above the ground and covered with dead leaves, straw, chips or whatever loose material may be at hand. Figs. 5 and 6. The spider watches for insects sitting in the top of the turret with the head above the edge and the feet turned under the thorax. Fig. 3.

Unlike the other species of this group, *nidifex* matures in the spring and freshly molted males and females may be found in Massachusetts from the tenth to twentieth of May. A half-grown male taken from its hole near Albany, N. Y., on May 16 matured and molted May 27.

This species is common in eastern Massachusetts in sandy soil at least partly covered with sod. At Plymouth it lives in the sandy hills within quarter of a mile of the seashore where pikei lives in the sand fields. At Tyngsboro it lives in similar places along the Merrimack River and in Wellesley and Waltham in open pastures with gravelly soil and thick sod. At the railroad station Karner, west of Albany, N. Y., it is abundant in the barren sandy fields. Southward it is common around Washington and at Atlanta, Ga.

This is probably *L. fatifera* Hentz, Boston Journ. Nat. Hist.,

Fig. 6. Mouth of burrow of *L. nidifex* surrounded by pieces of dry cow-dung, Waltham, Mass.

1841, though this name has been applied to several other species of large Lycosidæ.

Lycosa missouriensis Banks.

Pl. 4, Figs. 3, 3a, 3b, 3c.

Entomological News, 1895.

L. domifex, J. L.Hancock, Ent. News, 1899.

Female from Buffington, Indiana, has the cephalothorax 10 mm. long and the first leg 20 mm. Male from Havana, Ill., has the cephalothorax 8 mm. long and first leg 22 mm. The color is dull yellow brown, the femora lighter and brighter orange. The under side is pale without much variety in color except the distinct black of the three last joints of legs I and II. The spinnerets are brown

and the maxillæ and labium are darker than the sternum and coxæ, the tarsus and metatarus of legs III and IV are also a little darkened. On the upper side the cephalothorax is lighter in the middle without any distinct middle stripe. The abdomen is faintly marked with a series of dark and light transverse stripes. The mandibles are dark brown, black at the ends with orange hairs on the front. In young the femora are brighter yellow and the tibia and metatarsus of legs I and II are black above as well as below and in the adult male these joints are dark above though not as black as on the under side.

The burrowing habits of this species have been well described by Hancock in his account of *L. domifex*. The holes are made usually in sand but are sometimes dug in soil of any kind. I found two at Durham, North Carolina, in hard clay soil. There is usually a turret of some kind unless in open sand where there is no material for one. Fig. 4 shows the top of a hole at Buffington, Indiana, with a turret partly covered with leaves of the bearberry. The species matures in August and September and I have a male taken by Mr. A. G. Vestal at Havana, Ill., among litter on the ground as late as October 10. The eggs are laid in May, rather later than those of *wrightii*. One dug at Durham, North Carolina, early in July had young on its back.

This species is very abundant in the sand dune country along the Great Lakes. I found them at Sandusky, Ohio, near the summer laboratory of the University of Ohio, and they are common all through northern Indiana and Illinois. It does not mix its burrows with those of *wrightii* but each species lives in colonies of its own. R. V. Chamberlin reports it from Utah and *L. latifrons* Montgomery, Proc. Acad. Nat. Sci., 1904, from Texas, is said by Banks to be the same species.

In his account of *L. fatifera*, Hentz, in Boston Journ. Nat. Hist., 1841, mentions "a piceous variety" pale on the under side, which is probably this species.

Lycosa wrightii sp. nov.

Pl. 4, Figs. 4, 4a, 4b, 4c, 4d.

Although no description of it has been published, this species has long been known. J. L. Hancock in his account of *L. domifex* mentions several species of burrowing spiders in the neighbor-

hood of Chicago, of which this is no doubt one. I received a specimen from C. B. Davenport, then Professor in the University of Chicago, in 1904 and the last few years its habits have been studied by Mr. W. H. Wright, a teacher in Chicago from whom I have received specimens of both sexes.

This spider is a little smaller than *missouriensis* and lighter in color, the whole upper surface a light yellowish gray. The cephalothorax is lighter in the middle than at the sides but has no definite middle stripe. The abdomen has a dark mark in the middle over the dorsal vessel, around which may be a few bright yellow scales. At the sides of the abdomen in front the black edges of the ventral black spot extend far enough to be seen from above. On the under side the color is more varied. The tarsus, metatarsus and tibia of leg I are black, and the tarsus, metatarsus and part of the tibia of leg II are also black. The whole under side of the abdomen except around the epigynum and around the spinnerets is black and the spinnerets are also black at the ends. The ends of the mandibles are black and the maxillæ and labium are a darker gray than the rest of the body. The front of the mandibles is thinly covered with orange hairs and there is a little orange on the front of the head about the eyes.

In the male (Pl. 4, 4, 4a) the color is the same, but the legs are longer and more slender and the whole body smaller. The cephalothorax of an adult female measures 8 mm., that of a male 7 mm. Leg I of the female 18 mm., leg I of male 21 mm., a little longer legged in both sexes than *missouriensis*.

The burrows are like those of *pikei* without a turret or with only a few chips attached to the lining around the mouth. They are usually in clear sand and extend down 12 to 18 inches, enlarged at the bottom.

The spiders mature in August and September and the eggs are laid in the following May in light blue cocoons. Pl. 4, 4d. After laying eggs the females become darker in color and resemble more *L. missouriensis*.

This species is found at the eastern end of Lake Erie, opposite Buffalo, N. Y., at various places along the southern end of Lake Michigan (W. H. Wright), as far as Chicago and at Havana, Ill., in sand dunes along the Illinois river (A. G. Vestal).

DESCRIPTION OF PLATE 4.

Lycosa pikei, male 1, 1a, female 1b, 1c.
Lycosa nidifex, male 2, 2a, female 2b, 2c.
Lycosa missouriensis, male 3, 3a, female 3b, 3c.
Lycosa wrightii, male 4, 4a, female 4b, 4c, old female with cocoon of eggs, 4d.

THE STANFORD EXPEDITION TO BRAZIL, 1911.

J. C. BRANNER, *Chief.*

PARABIOSIS IN BRAZILIAN ANTS.[1]

BY WILLIAM M. MANN.

During the different visits of the members of the Stanford Expedition at Pará, the suburb Souza was found to be the best collecting ground, and much of their time was spent there. The combination of forest and good trails, quickly reached by electric cars, made the locality quite ideal for collectors having only a limited time at their disposal.

Here, as elsewhere in Brazil, ants abounded, and of these the small, black *Dolichoderus bispinosus* Oliv. was most in evidence. This species lives in carton nests, built on the branches of trees, though often a colony is found in a deserted termitarium. After a couple of attempts I gave up investigating the larger nests, for when these were disturbed myriads of ants swarmed out, literally tumbling over one another to the ground, where they scattered in all directions in search of the disturber. On hurriedly leaving the vicinity of one nest, I happened to leave my net lying on the ground. On my return, a few minutes later, it was covered with ants, each gripping so tightly that when I pulled it away its head often remained attached to the net. In young trees along the trails there were numerous small nests, four or five inches in diameter, and several of these were opened. Each contained, besides the *Dolichoderus*, a colony of a small black *Cremastogaster*. The smaller ants were not scattered throughout the nest, but were grouped in certain of the chambers.

Forel[2] has recorded observations which he made in Columbia

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[1] Contributions from the Entomological Laboratory of the Bussey Institution, Harvard University, No. 54.

[2] La Parabiose chez les Fourmis. Bull. Soc. Vaud. Sc. Nat. XXXIV, 130, p. 380–385.

on the association of ants belonging to the same genera. The colonies which he examined contained larvæ, and these were grouped separately in different parts of the nest. To this association, where colonies of different species live in the same nest, but in different chambers, and have no other relations with each other, each species foraging for itself, Forel has given the name "parabiosis." In the case of *Dolichoderus* and *Cremastogaster*, it would seem that all the advantage must be on the side of the latter, since it shares the nest built by the other and is well protected, without apparently contributing anything in return.

Among the observed species of *Dolichoderus*, *bispinosus* was the only one capable of being at all offensive to man. One species, *D. lugens* Emery, which was common on the upper Rio Madeira, attempts to defend itself by secreting from the anus a large drop of yellow, oily substance, but this has no effect on the human skin. *Dolichoderus debilis* var. *rufescens* hereafter described, attempts to defend its nest, but because of the small size and feeble mandibles, it is scarcely capable of repelling a large intruder.

In August, while collecting along a trail near Camp No. 41 on the Madeira-Mamoré Railroad in the State of Matto Grosso, my attention was attracted to a number of small red *Dolichoderus*. They were moving excitedly about, holding the abdomen up and a little to one side, so that they had a comically asymmetrical appearance. A tree by the trail had been felled, and in a fork of its branches, at what had been a height of approximately forty feet, I found the nest, an earthy structure, ovate in form, about a foot in length and eight inches in diameter. Fine roots of a plant ramified through this nest in all directions in such a manner as to make it quite firm, despite the nature of its component material. When I dug into the structure, numbers of the *Dolichoderus* rushed out. While collecting these I had a momentary glimpse of another ant, colored similarly to the *Dolichoderus*, but much larger, and with long legs. It emerged from one chamber and immediately disappeared into another. Hoping to collect this, as well as all phases of the *Dolichoderus*, I brought to the place a large quinine can, containing a piece of cotton saturated with chloroform, and began to dig and throw into this fragments of the nest. Hereupon numbers of the large ants rushed out, and my hand was severely stung before I realized that two colonies of ants,

one of them a stinging form, were occupying the nest. On examination, the fragments thrown into the can were seen to contain large numbers of both species, together with many larvæ and pupæ of each. The larger ant proved to be a Ponerine, of the genus *Odontomachus*. Males and females of *Dolichoderus* were also found, but there was none of these phases of the other. But the presence of many larvæ in all stages showed that the sexual forms of both species must have been present. During the two days following I revisited the nest frequently, and stirred it up. Each time both species of ant sallied out. Touching the nest lightly would bring out *Dolichoderus*, but it required a more vigorous prod to excite the other. My first examination had so disarranged the nest that I could make no close study of its structure, but was able to ascertain definitely that the *Odontomachus* were gathered together in its deeper recesses, while the smaller species occupied the peripheral chambers and galleries. No other nest was found, nor did I again find either of the ants. This may be readily explained by the usual inaccessability of tree tops to the collector, so failure to find more in no wise proves that the species are uncommon.

It is unfortunate that only one nest was found as this leaves some doubt as to whether the two species are normally parobiotic. *Odontomachus* is, as Wheeler's observations have shown,[1] entomophagus in habit. Mr. C. T. Brues tells me that in Grenada, B. W. I., he found numerous colonies of a closely related ant, *Anochetus emarginatus* Fabr., living in the nests of termites which form their chief food. In this case the ant lives in a small part of the nest constructed by the termites. This association is, of course, not in any sense parabiotic, and there is a possibility that the Brazilian *Odontomachus* may have been feeding on the *Dolichoderus* larvæ. But it seems hardly probable that the latter would remain in the same nest with a colony of ants which were destroying its young. That they had been associated for some time is shown by the presence of all stages of the immature forms of both species. *Odontomachus* is normally ground-inhabiting, nesting beneath stones or in rotten logs, but it is not surprising that a

[1]Biol. Bull. II, 1900.

species should have become arboreal in a region where so many animals have taken up this habit.

I admit that the finding of one example is not conclusive evidence of regular parabiotic association, but the observations here recorded seem to indicate a much closer relation than that of *Dolichoderus* and *Cremastogaster*, for it is evident that both species would derive benefit from the association. In the earthy, arboreal nest of *Dolichoderus*, *Odontomachus* finds a condition similar to that of the ordinary nesting place of the genus, while to the other, a feeble species, the advantage in having a colony of powerful stinging ants in the same nest is obvious, provided of course that it, itself, is not molested. For the reasons stated above, I do not believe that such molestation occurs.

The difference in the stimulus necessary to bring each species out of the nest is interesting. *Dolichoderus* sallied out at a slight disturbance, *Odontomachus* not until the nest was more thoroughly jarred and prodded. Ordinarily the smaller ant would be able to combat a feeble enemy, while one capable of seriously disarranging the nest would excite the more powerful nest-mate. This difference of habit was observed a number of times in the same nest.

As both of the forms of *Dolichoderus* and *Odontomachus* are new to science, I append a description of the worker of the latter and of all the phases of the former.

Odontomachus affinis Guérin, subsp. **mayi** subsp. nov.

Worker. Length 9.5 mm. Head, excluding mandibles, $1\frac{1}{2}$ times as long as broad. Mandibles $\frac{2}{3}$ length of head; inner edge with twelve fine teeth; apex with three large teeth, the most apical long and pointed, the most basal nearly as long, but sharply truncate; between these, closest to the most apical and one half as long as this is a smaller tooth. Thorax as in *affinis*, but sculpture on pronotum is longitudinally oblique. Petiolar node short and thick, spine slender, acuminate.

Head shining, finely punctate. Thorax opaque; pronotal sculpture strong, cencentric, on disc longitudinally oblique, diverging from the median impression. Abdomen smooth, shining.

Head with fine short, recumbent pubescence; vertex in front with two long hairs. Pronotum above with several long erect hairs. Abdomen with erect pile and recumbent pubescence. Coxæ and base of posterior border of femora with long hairs. Legs finely pubescent. Pubescence and pile pale yellow in color.

Color rufo-testaceous, the apex of the abdomen in some specimens is slightly darker. Mandibles fuscous.

Described from numerous specimens taken at Madeira Mamoré Railroad Company Camp, No. 41, 306 kilometers from San Antonio, State of Matto Grosso, nesting with Dolichoderus as described above.

The typical *affinis* differs from *mayi* in its larger size (length 12 mm.), coarser sculpture, which is transverse on disc of pronotum; absence of long hairs on the epinotum and on vertex, and black abdomen. Var. *mayi* is intermediate between the typical affinis and the small Central American variety *panamaënsis* Forel.

Named after Mr. May, senior member of the firm now building the Madeira Mamor´ Railroad Company.

Dolichoderus (*Monacis*) **debilis** var. **rufescens,** var. nov.

Worker. Length 3½ mm. Head excluding mandibles, behind nearly as broad as long, subcordate; eyes small, convex, a little posterior to middle of head; clypeus convex, anterior margin straight; mandibles short and thick; antennæ long, scape extending ⅜ its length past occiput; funicular joints sub-equal, except apical, which is 1½ times the length of preceding joint. Pronotum convex, broader than long, sides rounded without margin; spines short, acuminate, directed forward and outward, the distance between tips as great as width of head at base. Mesonotum convex; meso-epinotal impression very pronounced. Epinotum with sub-equal base and declivity; base feebly convex, seen from above rectangular, somewhat longer than broad, its lateral and especially its posterior borders strongly marginate; declivity arcuately excavated. Petiole broad, lamelliform, compressed anteriorly, its anterior surface flattened below and convex above, its apex with a minute tooth. Gaster broadly elliptical, about the length of thorax. Legs rather long.

Head and thorax sub-opaque with coarse shallow punctures, which are less numerous on the front of the former, and finer and more indistinct on the pronotum. Pleuræ longitudinally regulose. Mandibles rather shining, sparsely punctate. Petiole and gaster shining, very finely striolate and sparsely and finely punctate.

Hairs pale yellow, suberect on the gaster, clypeus and thoracic dorsum, fine and oblique on the antennæ and legs.

Color ferruginous red, mandibular teeth black, tibiæ slightly infuscated.

Female. Length 5 mm. Resembling the worker. Ocelli small. Pronotum 3½ times as broad as its length at middle, without spines. Mesonotum convex in front, more flattened behind. Epinotum rounded, without trace of margin, its base convex, about half as long as the concave declivity. Petiole as in worker. Gaster more elongate.

Sculpture similar to that of the worker, but the punctation of the head and thorax is somewhat coarser.

Wings. Length 5 mm. Infuscated; veins fuscous, except sub costa, which is piceous; stigma piceous.

Male. Length 3 mm. Head, excluding mandibles, broader than long, margin of occiput slightly concave; mandibles well developed, toothless; clypeus slightly convex, anterior border slightly accuate; eyes very large and convex; ocelli large; cheeks short; antennæ long, extending to second abdominal segment; scape short, barely extending to occiput; first funicular joint as broad as long, second three times length of first, joints 3–11 sub-equal, each about twice the length of first; terminal $1\frac{1}{2}$ as long as the preceding joint. Pronotum small, with convex sides. Mesonotum broad. Epinotum rounded above, with small tubercle at base of declivity. Petiole short; node thickened, short, rounded in front, nearly flat behind. Gaster short, much broader than deep. Legs slender.

Head and thorax opaque, coarsely punctate. Gaster shining. Head and thorax with abundant, erect fuscous pile. Gaster with semi-erect white pile. Antennæ with fine white pubescence.

Color black, except tarsal joints, which are fuscous. Genitalia yellow. Wings slightly infuscated, veins fuscous.

THE STANFORD EXPEDITION TO BRAZIL, 1911.

J. C. Branner, *Chief.*

NEW BEES FROM BRAZIL.

By T. D. A. Cockerell.
The University of Colorado, Boulder, Colo.

Eulæma manni sp. nov.

Male. Length about 19 mm.; anterior wing 16 mm.; facial quadrangle much longer than broad; clypeus high, broadly hollowed (not in the least keeled) in the middle, with a smooth band, bounded on each side by densely punctured regions; this central basin of the clypeus is bounded on each side by obtuse but well-developed longitudinal keels or ridges; labrum tricarinate; a large punctured basin below middle ocellus, the sides of which are continued below as an elevation (grooved in the middle) down middle of supraclypeal area; third antennal joint longer than fourth, but not nearly twice as long; mesothorax anteriorly dull, densely and minutely punctured, posteriorly shining in middle; scutellum shining, with very minute and feeble punctures, and scattered larger ones; abdomen finely granular; middle basitarsi long, with a rounded lobe behind at upper end; hind tibiæ greatly incrassate, the protuberances above the spurs small, but the apical half of the posterior side strongly grooved, and ending in three spines or teeth, of which the outer two are much nearest together; hind basitarsi produced to a sharp angle at apex; second s. m. very broad, receiving first r. n. at about the beginning of its

last third; second r. n. joining third t. c. Face and front brilliant green, the middle of the clypeus and supraclypeal area strongly flushed with crimson, the sides of the face with golden; mandibles black; vertex and cheeks a sort of dark copper color, with black hair; antennæ black, flagellum dark reddish beneath; prothorax dark coppery, with black hair; pleura dark purple, with dark hair showing reddish in favorable lights; nearly the anterior half of mesothorax brilliant green, with thin ferruginous hair, the posterior part, and the scutellum black (slightly brassy), with black hair; abdomen clear yellowish-green, with short ferruginous hair, becoming whitish apically, the basal segment with black hair at sides toward base; no bands on abdomen; apex of abdomen bituberculate; ventral surface of abdomen with segments 3 to 5 green, the others dark; tegulæ large, pointed posteriorly, anteriorly with a large green patch; wings strongly dusky, reddish; legs black, anterior tibiæ purple in front; middle tibiæ bronzy behind, in front flattened, dull and without punctures, suffused with carmine, except at apex, where they are bright blue-green; middle basitarsi densely covered on outer side with shining yellowish-white hair; hind basitarsi smooth and concave on outer side, on inner covered with black hair.

Hab.—Abuna, on the Rio Madeira, Brazil (*Mann & Baker*). A magnificent species, but superficially, when seen from behind, looking exactly like the common *E. mussitans* (Fabr.). It may also be compared with *E. superba* (Hoffm.), to the vicinity of which it runs in Ducke's table. *E. manni* will be especially known by its *mussitans*-like appearance, bicolored mesothorax, total absence of a median keel or clypeus, small size of the prominences above the spurs of hind tibiæ, and first abdominal segment colored like the rest. The coloration resembles that of *E. fallax* Smith, but that species has a central keel on the clypeus.

Xylocopa branneri sp. nov.

Female. Length 21 mm., anterior wing 16 mm.; exactly like *X. grisescens* Lep., but much smaller, with hair on sides of thorax all black. Abdomen beneath with a median raised line; clypeus smooth in middle except apically, lateral margins strongly elevated; labrum tridendate; wings dark, with bluish green and purple tints.

Hab.—Natal, State of Rio Grande do Norte, Brazil (*W. M. Mann*). Named after Dr. J. C. Branner, leader of the expedition.

Centris (Hemisia) **bakeri** sp. nov.

Male. Length about 13 mm., anterior wing 11; head and thorax black, with fulvous pubescence above, white below, and on cheeks and occiput, hairs of middle of vertex stained with fuscous; face narrow, eyes diverging below; clypeus strongly raised, with a broad flattened face, the sides of which are sparsely punctured; scape

short, yellow in front; flagellum reddish-black, apical half of the long first joint red beneath; clypeus (except a very broad black bar on each side), a transversely crescentic supraclypeal mark, lateral marks (pointed above on orbital margin), the short malar space, labrum and more than basal two-thirds of mandibles all lemon-yellow; tegulæ ferruginous, dark at base; wings reddish-smoky, nervures fuscous; legs black, with the tarsi, hind femora apically, and hind tibiæ for the greater part (the basal half behind) ferruginous; spurs ferruginous; spot at base of anterior and middle tibiæ, and long stripe on anterior tibiæ, yellow; hair of legs mostly pale, black on hind tibiæ except a large tuft posteriorly on apical half, on hind basitarsi reddish-black without and dark red within, but pale and strongly plumose posteriorly; hair on inner side of anterior and middle tarsi red; abdomen short and broad, dark metallic green, with the apical margin and sides of fourth segment, and the whole of fifth to seventh, clear red, a reddish suffusion also at sides of second and third apically; second and third segments each with large lateral yellow patches, that on the second much the largest, subquadrate; first abdominal segment, except at apex, and fourth and following segments, with pale hair; apex of first, and second and third, with thin short black hair, only visible in lateral view; venter with abundant pale reddish hair.

Hab.—Rio Madeira, Brazil; Madeira-Mamore R. R. Co. Camp 43 (*Mann & Baker*). This is 325 km. from Porto Velho. *C. bakeri* is a species of the *C. versicolor* group, recognizable by the yellow patches on the sides of the abdomen. *C. haemorrhoidalis* (Fb.) has a yellow spot on each side of the second abdominal segment, but the abdomen is quite a different color, and the thorax is dark-haired.

The three species of *Hemisia* in the collection are separable thus:

Wings bicolored, very dark, with broadly pallid apical field; hair of vertex (♀) black ..... *maculata* Lep.
Wings not bicolored 1
1. Abdomen yellowish-green, the hind margins of the segments pallid, but the apex not red; cream-colored spots at sides of segments 2–5, that on 2 a mere dot ..... *ænea* Lep.
Abdomen dark green, red apically; yellow patches on sides of second segment very large ..... *bakeri* Ckll.

Centris (*Ptilotopus*) **heterodonta** sp. nov.

Female. Very robust; length about 19 mm., anterior wing about 12; black, the legs and the end of the abdomen red; hair of head and thorax fulvous, without black or fuscous, paler beneath, becoming dull white on lower part of cheeks; scape thick, yellow in front; flagellum dark, ferruginous at extreme apex; clypeus convex with a large median cup-shaped black area, on which is a longitudinal yellow band, this band smooth and shining, but the black space on each side of it dull, with

scattered strong punctures; very broad anterolateral areas of clypeus yellow, as also are the lateral face-marks, which are triangular, the upper edge nearly straight, but with a linear process extending a short way up orbital margin; labrum pale yellow, broad, but with a median apical spine, which is dark reddish; no supraclypeal mark; malar space dark reddish; mandibles strongly curved, very broadly yellow basally, apically broadly red on outer side, teeth four, two apical, one about twice as long as the other (inner one), one broadly truncate and subemarginate on the inner side near the middle, and a short angular one at the base of that; lower part of sides of prothorax red; truncation of metathorax with a large whitish patch on each side; tegulæ light ferruginous; wings strongly dusky, marginal cell smoky, strongly appendiculate, the area above the appendicular nervure fuliginous; anterior and middle tibiæ with a yellow spot at base, and indications of a stripe on anterior pair; hair of legs bright ferruginous, cream-colored on anterior legs behind; scopa of hind tibiæ and basitarsus very large, strongly plumose, a very fine coppery red; abdomen with the first three segments black above, the hind margins of second and third dark red, the remaining segments red, the fourth dark basally; first segment with pale fulvous hair; second and third with very short inconspicuous black hair, the others with red hair; venter ferruginous; apical plate truncate.

Hab.—Porto Velho, Rio Madeira, Brazil (*Mann & Baker*). A very fine species, not close to any known to me. It is placed in *Ptilotopus*, but in spite of its lack of metallic color, it is doubtless allied to the species of *Hemisia*. In Friese's table of *Melanocentris* (*Ptilotopus*) it runs to 22, and except for its rather smaller size, on to the vicinity of *fuscata* or *fusciventris*, which it does not resemble. In the table of species with red abdomen it cannot be made to fit anywhere. It cannot be run to anything in Schrottky's tables of Brazilian or Paraguayan species.

Centris (*Ptilotopus*) **libertatis** sp. nov.

Female. Length about 11½ mm.; black, the head and thorax with fulvous pubescence, becoming white beneath, fuscous on vertex; clypeus much broader than long, rugose, with a longitudinal keel, a median triangular area black, the apex of the triangle downwards, the lateral areas, almost meeting below, yellow; a narrowly crescentic supraclypeal mark, lateral face-marks filling space between clypeus and orbit and sending a narrow band up orbital margin beyond level of antennæ, labrum entirely, and more than basal half of mandibles, all lemon-yellow; mandibles rather slender, not dentate; eyes yellowish-green; antennæ short, black, first joint of flagellum elongated; mesothorax and scutellum densely punctured; a slender hairless line along hinder middle of mesothorax, but no other bare space; tegulæ closely and minutely punctured, ferruginous, with broad whitish margin; wings strongly infuscated, nervures piceous, very heavy; the three submarginal cells about equally long below, the second broader than high, little produced at upper apical corner, receiving first r. n. about middle; marginal cell short, with a ful-

iginous streak at base; legs black, the middle and anterior tibiæ with a yellow spot at base; hair of legs black, in part very dark fuscous, thin and yellowish-white on outer side of anterior tibiæ, and a fringe of the same color on their femora; scopa of hind legs black, large and very coarse; abdomen black, moderately shining, with short black hair, the first segment without pale hair, but that of the fifth thin and white (best seen in lateral view), with an apical chocolate-colored fringe, and long chocolate hairs on each side of apical plate; beneath, the fourth segment has a conspicuous fringe of light hair.

Hab.—Independencia, Parahyba, Brazil (*Mann & Heath*). At first sight this seems a most ordinary little species, just like several of the *nitida* group. On closer examination, it appears not to be a typical *Centris*, by reason of the venation, which in Schrottky's table of Brazilian genera, would throw it out of *Centris* altogether. It is however actually allied to some of the *nitida* series, especially perhaps to *C. birkmanni;* Friese, which however has a much shorter first s. m., and the clypeus entirely black in the females.

Centris ceratocephala sp. nov.

Female. Length about 14 mm., unusually long and slender for a *Centris*, head and thorax black, abdomen bright red; legs red, the anterior ones, and the middle tibiæ, suffused with black. Very close to *C. bicornuta* Mocsary, having the same peculiar structure, but larger; the shining clypeus black with a triangular yellow mark on each side; wings dusky, but not dark; abdomen with the first segment suffused with blackish, but its hair all pale fulvous; second and third segments bare, fourth with fuscous hair, fifth with fulvous; scopa of hind legs entirely light fulvo-ferruginous. There is much black hair on the head above, both before and behind the ocelli. Mandibles bidentate; labrum longer than broad, black with two very large elongate yellow patches, which nearly meet in the middle line below, apex strongly bidentate, lateral margins obtusely angulate near the middle; teeth at sides of apex of clypeus long, black, cylindrical. Eyes dark brown. Hair of thorax above fulvo-ferruginous, without any dark.

Hab.—Manaos, Brazil (*Mann & Baker*). Possibly a subspecies of *C. bicornuta.* Manaos is more than a thousand miles from the type locality of *bicornuta.*

Dianthidium heathi sp. nov.

Male. Length about 5 mm.; head and thorax strongly and densely punctured; clypeus, mandibles except apex, broad bands along inner orbits and two long narrow bands passing just mesad of antennal sockets, all pale yellow; scape ferruginous; a continuous orange band across occipital region; mesothorax with very large punctures, black with somewhat more than the lateral thirds of the anterior margin broadly yellow; a broad yellow band from axillæ across scutellum, narrowly inter-

rupted in middle; legs reddish, blackish and yellow, the anterior femora and tibiæ broadly striped with yellow; tegulæ deep ferruginous, with an orange spot; marginal cell and apical part of wing dark fuliginous; abdomen black, with very broad oblique orange bands, widely separated in middle, on first segment, on second a narrowly pear-shaped yellow mark on each extreme side, on third a narrow yellow band on each side ending mesad in a very large elongate club, on fourth to sixth entire bands, that on sixth notched in front; seventh segment cream-color, the lateral corners with long straight spines, the truncate ends of which are dark, while in the middle is a very slight prominence. So close to *D. gregarium* (*Hypanthidium gregarium* Schrottky) that I had considered it identical, until I noted the antennæ, which is *heathi* are long but quite normal, the flagellum slender but not crenulate, dark above, ferruginous below, whereas in *gregarium* the flagellum is very long, strongly crenulate below, each joint light ferruginous with the base black, but the last entirely black; the armature of the apex of the abdomen is quite the same in both. These forms have pulvilli, and represent an aberrant section of *Dianthidium*.

Hab.—Independencia, Parahyba, Brazil (type locality), 3 males (*Mann and Heath*); Natal, Brazil, one male (*W. M. Mann*). The *D. gregarium* compared is from Villa Encarnacion, Paraguay, collected by Schrottky. An apparently allied species is *Anthidium pygmœum* Friese, known only in the female. Judging from Friese's description, our species is too different from *pygmœum* to be its male.

Ceratina chrysocephala sp. nov.

Female. Length about 9½ mm.; head and thorax very strongly and coarsely punctured, golden-green, the head with golden tints, the mesothorax with crimson, the posterior disc of mesothorax with a smooth dark area; pubescence very scanty, thin and white on pleura and sides of metathorax; mandibles and labrum entirely black; clypeus dull in the middle, and with large punctures, the lower margin with a very broad transverse orange band, not reaching lateral corners; lateral facemarks orange bands, very broad below, rather irregular on inner side, ending above at about level of antennæ; posterior orbits with broad orange bands, the upper part leaving the orbit; antennæ red as far as fourth or fifth joint, dark piceous or black beyond; scutellum closely punctured, roughly granular posteriorly; tubercles green; tegulæ dark chestnut; wings deep fuliginous, with violet tints; legs more or less green; anterior tibiæ with a yellow stripe, connecting with a spot at apex of femur; middle tibiæ with a yellow basal spot, hind tibiæ ferruginous at base; hind tibiæ with much white hair; middle femora conspicuously angled beneath toward base; abdomen shining dark bluish-green, with slight brassy tints, strongly punctured; sixth ventral segment subcarinate.

Hab.—Manaos, Brazil (*Mann & Baker*). In Schrottky's table of Brazilian species this runs to the vicinity of *C. longiceps* Sm. and *cupriventris* Sm. The shape of the head is not at all as in

longiceps, while the colors and markings disagree with *cupriventris*. In Schrottky's later table (Zeits. Hym. Dipt., 1907, p. 480) this runs to *C. gossypii* Schrottky, which really seems to be closely allied, but in *gossypii* the pleura is finely punctured, the scutellum is blue-green, and there are various other differences. Comparison with other recent descriptions does not indicate identity in any case.

Ceratina manni sp. nov.

Female. Length about 4½ mm.; dark but shining bluish-green, the apical half of the abdomen roughened; sides of front hardly punctured; a large broad elongate (vertical) mark on clypeus, a small broad-oval mark on each side of it, a broad elongate mark (like that on clypeus, but smaller) along each anterior orbit opposite antennæ, and a stripe on each cheek (receding from orbit) all ivory-white; mandibles and labrum dark, the labrum and apical half of mandibles obscurely reddish; antennæ black basally, the thick flagellum light ferruginous below, dark rufopiceous above; tubercles broadly white margined; tegulæ dark reddish; wings dusky. The mouthparts are not greatly elongated. Tarsi dusky reddish; anterior tibiæ with a pale stripe. (In *C. lucidula* the legs are pale testaceous.)

Hab.—Independencia, Parahyba, Brazil, 6 females (*Mann & Heath*). This little species resembles *C. nautlana* Ckll., but is at once distinguished by the five light marks on face. It also resembles, on account of its small size, *C. lucidula* Sm., *muelleri* Friese, *gossypii* Schrottky, and *minima* Friese, but it will not agree with any of them. Ducke says that *muelleri* is the same as *lucidula*, but the legs are quite differently colored. *C. minima* is known only in the male, but I am confident that *manni* is not its female.

Melipona pseudocentris sp. nov.

Worker. Length about 11½ mm.; head and thorax with pale fulvous pubescence, bright orange-fulvous in middle of pleura; clypeus light ferruginous, the upper border infuscated, a median stripe and the lateral corners cream-colored; a crescentic cream-colored supraclypeal mark, bordered above by ferruginous; cream-colored lateral face-marks broad below, narrowing above, ending above level of middle of front; scape red; third antennal joint conspicuously red beneath; abdomen bright chestnut red, with coarse black hair in apical region, but tuft at extreme apex ferruginous; legs red and black. Extremely close to *M. rufiventris* Lep., from which it differs in its larger size and considerably darker abdomen. The legs are marked exactly as in *rufiventris*, and the face markings essentially agree.

Hab.—Manaos, Brazil (*Mann & Baker*). I should have considered this a local race, or perhaps individual variety, of *M. rufi-*

ventris, were it not that the two specimens are quite alike, while a *rufiventris* from Abuná exactly agrees with one from F. Smith's collection, now in my possession. There is accordingly some evidence of stability in the comparatively slight characters noted. The name of the species is derived from the fact that superficially it is exactly like a red *Centris*, such as *C. tarsata* Smith. Ducke asserts that *M. mixta* Lep. is the same as *rufiventris*, but Lepeletier says the hair of the head and thorax in *mixta* is black. Ducke also makes *M. fulva* Lep. a synonym of *rufiventris*, but according to a specimen before me, from F. Smith's collection, it is quite distinct; the legs, as Lepeletier describes, are fulvous, the hind tibiæ without black markings, although the anterior and middle tibiæ are strongly infuscated. In *rufiventris* the hind tibiæ are red with about the apical half black, and there is long black hair on the posterior margin.

Melipona abunensis sp. nov.

Worker Length 10 mm. or slightly more; head, thorax and legs black, the large apical tarsal joints dark red; abdomen chestnut red, without bands; head broad; clypeus bare, dullish, minutely roughened, with a feebly indicated median dark red stripe; mandibles black, edentate; malar space large; sides of face bare; scape black, red at extreme base; flagellum reddish beneath; vertex with long black hair, occiput with light fulvous hair; mesothorax shining black, more than the posterior half bare, anterior part with long black hair, with shorter pale hair intermixed; scutello mesothoracic suture with black hair in front and pale behind; scutellum prominent, wholly black, apically with a tuft of long black hair, but the hind margin with long pale fulvous hair; sides of metathorax with pale hair; hair of pleura pale anteriorly, but black below wings; anterior femora fringed with whitish hair behind, their tarsi with red hair on inner side; the broad hind tibiæ fringed with black hair; tegulæ ferruginous; wings orange-ferruginous, with ferruginous nervures; hair of apical part of abdomen mainly ferruginous, but some dark hair at sides of the last three segments; first abdominal segment with a black spot on each side.

Hab.—Abuná, Rio Madeira, Brazil (*Mann & Baker*). The general appearance is like an overgrown *M. mandacaia* Sm., with the abdomen much brighter red. On more detailed comparison there are many differences, as in the color of the legs and base of abdomen.

Trigona manni sp. nov.

Worker. Length 7½–9 mm., the wings about 8 mm.; rufotestaceous, the head black, marked with very pale yellow, and the mesothorax black or piceous, mar-

gined with yellow; pubescence light fulvous; mandibles light yellow, black at tip, with a strong tooth at inner corner; malar space narrow but distinct; clypeus, except a pair of subobsolete reddish bars, elongate supraclypeal mark (its upper part reddish), and broad lateral face-marks, all pale yellow, the lateral marks filling space between clypeus and antennæ and eyes, ending squarely a little above level of antennæ; front and mesothorax pruinose with fine yellowish-gray hair; scape pale yellow-testaceous, black above at apex; flagellum dark above and ferruginous beneath, last joint red also above; prothorax yellow; narrow lateral margins of mesothorax yellow, and anterior margin broadly subtestaceous, except a central portion, which is dark; tegulae rufo-fulvous; wings very long, suffused with orange, except the broad apical field, which is grayish; nervures ferruginous; legs bright ferruginous, with ferruginous hair, but the broadly expanded apical part of hind tibiæ piceous, the hind basitarsi black, and the small joints of hind tarsi dark red; abdomen of the long and narrow type, shining, with scanty red hair.

Hab.—Porto Velho, Rio Madeira, Brazil, two, one the type (*Mann & Baker*). Also one from Abuná, Rio Madeira (*Mann & Baker*). Related to *T. clavipes* (Fabr.), which it resembles a good deal in the markings of the head and thorax, but much larger, with longer wings, the scutellum wholly light, etc. It is one of the species placed in the subgenus *Tetragona*.

Trigona rhodoptera sp. nov

Worker. Length about 7½ mm., the very ample wings a little over 8; head black, with the clypeus, supraclypeal area, and more than lower half of cheeks (except a band along orbits) ferruginous; hair of vertex and front dark fuscous; sides of face pale grayish pollinose; cheeks densely covered with a short pale yellowish tomentum; eyes ferruginous; mandibles quinquedentate, dark reddish, blackish apically; malar space quite distinct; scape ferruginous, black above at apex; flagellum clear ferruginous beneath, black above, except at apex; thorax entirely bright ferruginous red, with hair of the same color; tegulæ red; wings very red, orange-fulvous, nervures clear red; legs red, with the greatly broadened hind tibiæ more or less infuscated, having especially a black patch covering the inner half (on both sides of the tibia) apically; middle and hind tarsi infuscated; long hair on margin of hind tibiæ sooty; abdomen short, very shiny, dark fuscous with the base pale rufotestaceous.

Hab.—Type from Abuná, Rio Madeira, Brazil (*Mann & Baker*). Also one from Madeira-Mamore R. R. Co. Camp 41, Rio Madeira, Brazil (*Mann & Baker*). Superficially not unlike *T. manni*, but entirely different in the markings of head and thorax and character of the mandibles. *T. pallida* Latr., also collected at Abuná, is much smaller, with differently colored wings. *T. williana* Friese must be a similar insect, but it has ferruginous hairs on the hind

tibiæ, and the margins of the wings broadly smoky; the head also must be different.

Trigona frontalis flavocincta subsp. nov.

Worker. Like *T. frontalis* Friese, but the pale markings of the thorax light yellow instead of white; all the femora and anterior and middle tibiæ and tarsi, clear ferruginous. Length 3 mm.

Hab.—Independencia, Parahyba, Brazil (*Mann & Heath*). Friese described *T. frontalis* from Honduras, without citing any precise locality or collector. Professor C. F. Baker kindly sent me four which he collected at Chinandega, Nicaragua. Some of the same lot, he informed me, were determined by Friese.

Trigona pellucida sp. nov.

Worker. Like *T. amalthea* (Oliv.) except that the wings are clear, somewhat milky, with the apex a little dusky, the stigma and nervures bright clear ferruginous; abdomen sepia-brown basally; hind tibia reddish, but dark; small joints of tarsi deep ferruginous. Length 5½ mm., anterior wings 5. Mandibles dentate, obscure reddish at apex. Dorsal surface of abdomen distinctly keeled.

Hab.—Porto Velho, Rio Madeira, Brazil, one (*Mann & Baker*). This seems to be related to *T. amalthea* as *T. flavipennis* Friese is to *T. ruficrus*. Possibly both represent mutations.

Trigona branneri sp. nov.

Worker. Length 6½ mm., anterior wing 6⅔; like *T. guianæ* Ckll., but smaller, with the wings only very faintly dusky, with a yellow stain in the base of the marginal cell and along the subcostal and basal nervures; abdomen shining black; short tomentum of thorax above dark fuscous, hardly noticeable; mandibles dark castaneous, dentate. The series of eight is quite uniform in appearance. Compared with *T. ruficrus*, it is at once known by the pale wings, and the black hind legs; compared with *T. amalthea*, it is larger, with pale wings, and the scape and flagellum both chestnut red beneath. The wings, although pale, are dusky compared with those of *T. pellucida*. I might think *T. branneri* to be *T. flavipennis* Friese, but Friese says the posterior tibiæ of his species are more or less fulvous, which is not true of ours. A species which superficially looks just like *T. branneri* is *T. postica* (Latr.), but *postica* has a dull abdomen (except the extreme bases of the segments), with two patches of light pubescence on the fifth segment, and also a finely rugose punctate mesothorax.

Hab.—Manaos, Brazil, eight (*Mann & Baker*).

Trigona spp.

Twenty-three specimens from Porto Velho, Abuná and Madeira-Mamore R. R. Co. Camp 41, represent at least three species of the *amalthea* group, which I do not at present attempt to describe. It appears that in this group of *Trigona* there exist numerous very closely allied races or species, but at present it is difficult to define them or to decide whether they are really distinct from various previously published members of the genus. They should be collected, like ants, in large numbers from individual nests.

Coelioxys ardescens sp. nov.

Male. Length 10 mm. or slightly over; black, with the tegulæ and legs bright ferruginous; hind tarsi black, abruptly contrasting with the red tibiae; first abdominal segments, and sides and extreme base of second and third, dark red; ventral surface of abdomen wholly dark red, with white hair-bands; eyes brownish-gray, with very short hair; mandibles red, black at apex; lower part of cheeks and base of mandibles with very dense pure white hair; face and front densely covered with silky pale fulvous hair; vertex flattened, strongly punctured, with very short and scanty black hair; antennæ entirely black; mesothroax shining, with very large scattered punctures; an undulating band of hair along front of mesothroax, a stripe (enlarging posteriorly) at sides, and two transverse patches in scutello-mesothoracic suture, all lively fulvous; hair of under side of thorax white; scutellum smooth, impunctate in middle, with large punctures at sides, apex angularly produced and slightly upturned; axillar spines rather short; wings hyaline, faintly dusky, the apical margin broadly dusky; stigma ferruginous, nervures fuscous; anterior coxal spines short and stout; tibial spurs red; abdomen shining, first segment rather sparsely punctured, the others largely impunctate in middle, except at base and apex; first segment with an entirely uniform, narrow yellowish hair-band; third to fifth with subdorsal transverse stripes of grayish tomentum, and second to fifth with apical hair-bands at sides only; sixth segment elongate, deeply and broadly sulcate in middle, with a long sharp spine on each side near base, the four apical spines sharp, the lower somewhat the longest; venter sparsely punctured, with very faint indications of a keel. The scutellum shows no trace of a keel.

Hab.—Porto Velho, Rio Madeira, Brazil (*Mann & Baker*). Of the genus *Coelioxys* no less than 94 neotropical species have been described, but I cannot identify this with any of them. It appears to be close to *C. lævigata* Smith, from Pará, but the angular apex of the scutellum of our species can hardly be called "a broad spine," while the account of the abdominal banding does not at all agree. In Schrottky's table in his Catamarca paper (1909) *C. ardescens* runs to *C. edentata* Schrottky, and agrees well in several

respects, but that species is evidently much more closely punctate, and the lateral spines of the sixth segment are said to be short. In Schrottky's table of Brazilian species it runs to the vicinity of *C. agilis* Sm., which is smaller, with no red on abdomen, and *C. rufopicta* Sm., which is larger, with darkened wings in which are irregular transparent spaces. In Holmberg's table (1903) it runs out at 23, because the fourth ventral segment is perfectly simple, without any process or teeth. In Friese's Argentine table (1908) it runs to a species doubtfully determined by him as *C. simillima* Sm., but I have seen the type of *simillima*, and it has a dark stigma (cf. Trans. Am. Ent. Soc., XXXI, 335). Comparison with the various species not included in the tables does not indicate identity in any case. Among the northern species, our insect is to be compared with the Mexican *C. otomita* Cresson, to which it must be closely allied, differing however in the abdominal banding.

Cænonomada tertia sp. nov.

Male. Length 8½–9½ mm.; structure as in *C. bruneri* Ashm.; bright lemon yellow and black, the thin long hair very pale fulvous above, white beneath; eyes fusco-ferruginous; clypeus very prominent, bright lemon yellow with a black band along upper margin, above which is a large semicircular supraclypeal mark; labrum, basal two-thirds of mandibles, and broad bands along anterior and posterior orbits, all yellow, the band along anterior orbits ending in a sharp point on orbital margin little below level of anterior ocellus; front shining, concave; scape greatly swollen, bright yellow, with a triangular black patch at end; flagellum ferruginous, dark fuscous above, with the structure typical of the genus; upper part of prothorax broadly yellow; mesothorax dull black, the lateral margins and two very conspicuous longitudinal stripes (not reaching anterior or posterior margin) yellow; pleura with an elongate yellow patch; axillæ, anterior half of scutellum, postscutellum, and a very large C-shaped mark on each side of metathorax, yellow; area of metathorax triangular, black; legs yellow, black at base; hind tarsi ferruginous, with ferruginous hair on inner side; hind femora yellow on outer side, black beneath, on inner side black with two large yellow marks; abdomen bright yellow with six broad black bands; apical plate yellow, black at apex; venter black in middle, yellow at sides; tegulæ fulvotestaceous, with a yellow spot; wings moderately dusky; venation normal, third s. m. much longer than first or second. The six-jointed maxillary palpi are very slender. Hind tibia with one spur very large, the other very small.

Female. Length 10½ mm.; similar to the male, but the yellow not so bright, and with the usual sexual differences; clypeus shining black, punctured, with about the lower half pale yellow, except in middle; lateral face-marks broad below, but abruptly cut-off at about level of antennæ, except for a slender line which continues

up orbit; scape not enlarged, black with the basal two-thirds yellow in front; yellow markings of thorax nearly as in male, the two stripes on mesothorax well-developed, but the tubercles are entirely dark, the pleura has no yellow mark, the yellow band on scutellum is broadly notched behind, and the yellow of the metathorax is reduced to an irregular mark shaped rather like an agaric, at each side of the enclosure; tegulæ rufofuscous, with a very small yellowish spot; legs black, anterior pair with a yellow stripe from near middle of femora nearly to end of tibiæ; middle legs with a yellow patch on apex of femora and base of tibiæ, hind legs with a yellow mark at end of femora; anterior and middle tarsi thick, with reddish hair; posterior knee-plate large, long-oval, covered with dark reddish hair; long hair of hind tibiæ and basitarsi white on outer side, shining yellowish-white on inner side of tibiæ, dark fuscous on inner side of basitarsi; both tibial spurs of hind legs large; apical plate of abdomen with fine concentric striæ; apical hair chocolate, but ventral segments fringed with white hair; venter all black.

Hab.—Independencia, Parahyba, Brazil, 2 males, 1 female (*Mann & Heath*). This is the third known species of *Cœnonomada*. It is close to *C. bruneri* Ashm., but easily separated by the presence of large yellow stripes on the mesothorax in both sexes, and other details of the markings. From *Cœnonomada pluricincta* (*Tetrapedia pluricincta* Vachal), from Goyaz, it is separated by the yellow markings of the thorax, the color of the legs, etc. Vachal suggests that *Epicharis unicalcarata* Ducke may also prove to belong to *Cœnonomada*. Vachal protests against the use of Ashmead's generic name *Cœnonomada*, on the ground that the description was insufficient, and the insect was placed in the wrong family. I believe, however, that *Cœnonomada* must be considered to have been established according to the rules, although one could wish it were possible to adopt instead Holmberg's *Chacoana*, which was well-defined and well understood by its author.

Psænythia canina sp. nov.

Male. Length about 8 mm.; black with bright lemon-yellow markings, no red on head, thorax or abdomen; head extremely broad, eyes diverging below; clypeus with long pointed lateral lobes; clypeus (except two dots and lower margin), a large quadrate area (twice as broad as long) on labrum, broad lateral face-marks shaped like the mainsail of a schooner, large dog-ear marks, and an elongated mark on upper part of cheeks, all yellow; supraclypeal area and scape entirely black; flagellum ferruginous beneath, darkened basally; mandibles long and slender, the basal half yellowish, the apical red; front rugose, cheeks shining; mesothorax shining, very finely and closely punctured; upper border of prothorax, tubercles and a spot behind them, a pair of oblique marks extending over axillæ and side of scutellum, a stripe on postscutellum, and two marks near the middle of the base of meta-

thorax, all yellow; scutellum shining, the punctures larger and much less dense than on mesothorax; legs piceous, the small joints of tarsi light reddish-brown; a small spot on all the knees, stripe on anterior tibiæ, and base of middle tibiæ above, yellow; hind tibiæ with silvery-white hair; tegulæ light fulvotestaceous; wings dusky; abdomen with bright yellow bands on first six segments, widely interrupted on second and third, with a linear interruption on the others; apical plate very large, obtusely emarginate, bulging laterally; genitalia ferruginous. Third s. m. unusually long.

Hab.—Independencia, Parahyba, Brazil (*Mann & Heath*). In the tables by Schrottky and Friese this runs to *P. burmeisteri* Gerst, which however is much larger, and otherwise different. From all the races of *P. picta* Gerst., it is known not only by the details of the markings, but also by the very much more finely punctured mesothorax. In the shape of the head, and in the face-markings, there is much resemblance to *P. philanthoides* Gerst., but the head is broader, and the colors are quite different. The name *canina* may be taken to refer to the bulldog-like head or to the well-developed dog-ear marks.

Megachile lenticula Vachal.

Female. Length 10½–13 mm.; black, including the legs, except that the hind coxæ, trochanters and basal half of femora are ferruginous above; tegulæ clear bright ferruginous, the anterior margin somewhat expanded; wings strongly dusky; hair of vertex, mesothorax and scutellum coarse and black, of sides of thorax fulvous above, whitish below, with a little black hair below the wings; metathorax with pale fulvous hair, and pale hair in scutello-mesothoracic suture; face and front with mixed cream-color and black hair; clypeus and supraclypical area bare, shining, with scattered punctures; middle of clypeus flattened, sides subrugose, lower margin thickened and broadly concave; mandibles quadridentate; abdomen with narrow entire pale fulvous bands on the second and following segments, and pale fulvous hair at extreme sides of first; basal part of abdomen red beneath; ventral scopa creamy-white, largely black at sides and apex.

Hab.—Porto Velho, Rio Madeira, Brazil (*Mann & Baker*). Madeira-Mamore R. R. Co. Camp 43 (*Mann & Baker*). Male also at Porto Velho. I had regarded the female as a new species, but it is evidently the undescribed sex of *M. lenticula* Vachal. The following table contrasts the female with some species which it resembles.

Ventral scopa "nearly white," without black; abdomen not banded. **nudiventris** Sm.

Ventral scopa black at apex, and more or less at sides..... 1

1. Hair around base of antennæ bright rufofulvous.....**constructrix** Sm.
   Hair around base of antennæ not brightly colored.....2
2. Length 9–10 mm.; hair of face mainly black.....**schrottkyi** Vachal
   Length 10½–13 mm.; hair of face as much pale as black.....**lenticula** Vachal.

Megachile virescens sp. nov.

Female. Length about 12 mm.; black, the tarsi dark brown, the dorsum of abdomen with variable, sometimes very conspicuous, green tints, with also suggestions of dark purple; hair of head and thorax white, the dense bands in front and behind the scutellum, the dense tuft behind the tegulæ, and to some extent the hair of upper part of sides of thorax, creamy-tinted; vertex with short black hair; hair of legs white, orange-ferruginous on inner side of tarsi; abdomen with moderately broad, entire creamy-white hair-bands at the apices of the segments; sixth segment with appressed gray hair; ventral scopa yellowish-white, black on last segment; mandibles quadridentate, black, with an obscure reddish subapical band; clypeus and supraclypeal area shining, strongly punctured, the punctures sparse in middle, antennæ black; area between the ocelli with large well separated punctures, but that on either side of them densely and minutely punctured, in complete contrast; mesothorax with the anterior half dull, the posterior half shining, with fine punctures of various sizes, but none large; scutellum posteriorly with black hair; tegulæ piceous, finely punctured; wings strongly dusky, posterior basitarsi broad and flat; abdomen of the triangular type.

Hab.—Baixa Verde, Rio Grande do Norte, Brazil (*Mann*). Extraordinarily like *M. deceptrix* Sm. from S. Domingo (West Indies), but the flagellum in Smith's species is fulvous beneath. It is also very close to *M. chrysophila* Ckll., from Mexico, but that has a densely granular abdomen, without green tints.

Megachile microsoma sp. nov.

Male. Length about 6½ mm.; black, the anterior tibiæ slightly reddish in front, the hind tibiæ distinctly reddish on inner side toward apex; head very large, as large as thorax, abdomen short; hair of head and thorax above scanty, partly black and partly pale yellowish (the latter easily overlooked); front and area just below the antennæ with black hair, but pale hair at sides of face, and lower margin of clypeus densely covered with silky white hair; cheeks below with long white hair; under side of thorax with dense white hair; basal part of abdomen with short black hair, but sides of third segment at apex, a broad entire apical band on fourth, all of fifth (densely only at apex), and all of sixth very densely, covered with pale fulvous hair; hair of legs scanty and white, fulvous on inner side of tarsi; clypeus shining, with large strong punctures, which are very sparse in middle; supraclypeal area entirely dull, densely granular; antennæ long, entirely black; mesothorax finely and closely punctured; tegulæ rufopiceous, very dark; wings dusky, the costal region very dark; stigma rather large; anterior legs simple, their coxæ unarmed; sixth abdominal segment retracted, with two distant sharp black teeth.

Hab.—Porto Velho, Rio Madeira, Brazil (*Mann & Baker*). This little species resembles the Mexican *M. bidentis* Ckll., but differs in the color of the wings, dark fuscous nervures, and somewhat larger head. They are however closely related. The color of the nervures and tegulæ will also separate *M. microsoma* from the South American *M. pilosa* Sm.

Megachile permunda sp. nov.

Male. Length about 9 mm.; black, the femora and tibiæ a rather lively chestnut red, all the tarsi light yellow; a short compact species, superficially like the Australian *M. sequior* Ckll.; eyes light green, the lower part tinged with red; mandibles and antennæ black, the flagellum very faintly reddish below; face densely covered with shining golden hair; lower part of cheeks, and under side of thorax, with pure white hair; the broad vertex, and thorax above, with long erect dark fuscous hairs, but mesothorax margined all round, and scutellum in front and behind, with dense fulvous tomentum, the edge of the fulvous area in front of mesothorax trilobed or tridentate posteriorly; abdomen with entire pale fulvous apical hair-bands, but band on fourth segment broadly interrupted, while fifth has no apical band, but its basal third or more is densely covered with appressed fulvous hair; sixth segment densely covered with creamy-white hair, except the projecting margin, which is broadly emarginate, but otherwise simple; ventral segments with white hair-bands; apical antennal joint slightly broadened; mesothorax and scutellum dull, densely granular; tegulæ dull ferruginous; wings dusky; anterior coxæ with strong black spines; anterior tarsi hardly broadened, but with a long white fringe behind, on the inner side of the fringe is some black hair; middle tarsi posteriorly with extremely long white hair; hind tarsi with long white hairs in front; spurs yellowish-white.

Hab.—Natal, Brazil, two males (*W. M. Mann*). Except for the almost simple anterior tarsi, this much resembles the Mexican *M. veraecrucis* Ckll.

Exomalopsis paraguayensis manni subsp. nov.

Female. Length about 8½ mm.; black, the mesothorax, scutellum and abdomen shining; agrees with the description of *E. paraguayensis* Schrottky, except as follows: mesothorax shining, not very densely punctured, the anterior third with scanty pale hair, the posterior part with very scanty black hair, easily overlooked; scopa of hind legs creamy-white, the basitarsi densely black-haired behind; wings dusky at apex; stigma large, amber-color, nervures more dusky; tegulæ rufopiceous. The head is broader than long, and the abdomen is elongate, not subglobose as in many *Exomalopsis*. The base of the metathorax is roughened. The mandibles are black, with a bright red spot about the middle. The b. n. goes basad of t. m., and second s. m. is very small.

Hab.—Natal, Brazil (*W. M. Mann*). Probably a distinct species, but agreeing so nearly with the description of *D. paraguayensis* that I leave it for the present as a subspecies.

Tapinotaspis heathi n. sp.

Male. Length about 8½ mm., anterior wing nearly 8; shining black, the supraclypeal region, front and abdomen very brilliant; pubescence mainly black, but dense and shining creamy-white on clypeus and sides of face, long silvery hairs project below mandibles, the anterior half of pleura has long plumose white hair, anterior legs with white hair on outer side, hair on inner side of hind tibiæ dull white, and on inner side of their tarsi pale ferruginous; fourth abdominal segment with a tuft of white hair on each side, fifth and sixth with white hair at sides, and dorsally in the subapical region with glittering, pale, partly metallic hairs; under side of abdomen with black hair-bands; hair of thorax above, and the very abundant hair of middle legs, all black; malar space obsolete; supraclypeal area smooth and impunctuate; antennæ long and slender, scape black, flagellum ferruginous, pale beneath, the first joint largely dark, *the last three joints on inner side, and a square patch on apical part of the one before, shining snow-white;* mesothorax microscopically sculptured; anterior wings dark fuliginous, the apical field very large, nervures fuscous, stigma rather large, reddish; b. n. meeting t. m.; marginal cell obtusely pointed at apex, away from costa; first and second submarginals about equal, third larger; second quadrate, narrowed about a third above, receiving first r. n. almost at its apex; third s. m. broader above than second, receiving second r. n. a little beyond beginning of its last third; lower wings hyaline, darkened on costa and broadly so at apex, anal lobe very well developed; hind basitarsus nearly as long as tibia, produced at end into a thumb-like lobe which is largely red; first three abdominal segments without apical hair, except at sides; fourth with a short purplish-black fringe, fifth and sixth with heavy black fringes; apical plate broadly truncate. The elongate two basal joints of labial palpi are subequal.

Hab.—Independencia, Parahyba, Brazil (*Mann & Heath*). This may perhaps have been described as a *Tetrapedia* from the female, but if so, there is no way to ascertain the fact. It looks like *Tetrapedia diversipes* Klug, except for the smaller size and the color of the hair on the hind legs. The venation is however entirely different from that of *T. diversipes*, and also very different from *Exomalopsis*, to which genus I next thought to refer it. The reference to *Tapinotaspis* is unsatisfactory, because the second submarginal cell is not at all as in that genus, but it is possible that the definition of *Tapinotaspis* may be altered to include such forms as the present. *Tapinotaspis* is considered by Brethes a synonym of *Tetrapedia*, while a species was described by Friese as an *Exomalopsis*. It is probably a valid genus, or at any rate, the species

now described is generically distinct from both *Tetrapedia* and *Exomalopsis*.

Diadasia Patton.

The three bees described below are referred to *Diadasia*, which is probably distinguishable from *Ancyloscelis*. I have not been able to examine the type of *Ancyloscelis* (*A. ursinus* Hal.), but from what I can learn, I believe it is a *Dipedia* or *Leptergatis*. Holmberg's *Leptometria* and *Teleutemnesta* have been referred to *Ancyloscelis*, but they have an apparently valid character in the hind wings, pointed out by Holmberg; the separation of the discoidal and cubital nervures takes place about half way between the transverso medial and the transversocubital, instead of very much nearer the transversomedial as in *Diadasia*, etc. In this character the bees now described agree with *Diadasia*, and are readily separated from *Leptometria* and *Teleutemnesta*. The North American *Dasiapis*, which in some ways closely resembles *Leptometria*, has the *Diadasia* venation of the hind wings.

Diadasia parahybensis sp. nov.

Male. Length about 6½ mm., the abdomen short and subglobose; black, wholly without light face-markings, the long tarsi, and apical spot on tibiæ, ferruginous; eyes pale ochreous; facial quadrangle very much longer than broad; hair of head and thorax very pale ochreous, almost white, quite white below; on vertex the short hair is stained with brownish; flagellum ferruginous beneath; mesothorax shining, with rather dense strong punctures; tegulæ dark reddish; wings strongly dusky; b. n. meeting t. m.; middle and hind femora incrassate, but not excessively so; hind spur of hind tibia considerately longer than the other; hind basitarsus gently curved; abdomen covered with a short felt-like reddish tomentum, the hind margins of the segments broadly pallid but also hairy.

Hab.—Independencia, Parahyba, Brazil (*Mann & Heath*). In Friese's table of *Ancyloscelis* (Flora og Fauna, 1908, p. 51) this runs to 4, and runs out on account of its size, but really comes nearest to *A. riparia* Ducke, with which it agrees in the keeled sixth ventral segment of abdomen; it differs, however, by the dusky wings and the color of the hair of the head. In my table of North American species (Amer. Nat., XXXIX, p. 742) it runs to *Diadasia diminuta* (Cr.), from which it differs at once in the character of the abdominal hair, which in *diminuta* is long and loose.

Diadasia murihirta sp. nov.

Male. Length about 11 mm.; black, the head and thorax with rather dense hair, which is warm ochreous above (fuscous on scutellum, and slightly so on disc of mesothorax) and white below, the transition from one color to the other quite gradual; small joints of tarsi ferruginous; antennæ short for a male, the flagellum obscurely reddish beneath; clypeus densely covered with light hair; mesothorax with small but strong and rather close punctures; hind femora incrassate but not at all subglobose; spurs piceous (in *D. parahybensis* they are cream-color); hind basitarsus curved, red at apex but not prolonged; tegulæ fuscoferruginous, pallid at sides; wings moderately dusky (not reddish as they are in *D. sumichrasti vulpihirta*); abdomen with pale ochreous hair on first segment, the other segments with very short and thin black hair (obscure brown on basal half and sides of second), and broad dense apical ochreous hair-bands; sixth ventral with a large median hair-tuft.

Hab.—Independencia, Parahyba, Brazil, 2 males (*Mann & Heath*). In Friese's table runs to *facialis* Friese, differing in the total lack of light face-markings. In the North American table it runs to the Mexican *D. sumichrasti* (Cr.), but the hair is less brightly colored, while the second s. m., is broader above than in *sumichrasti*, and receives the first r. n. nearer the apex.

Diadasia sumichrasti vulpihirta subsp. nov.

Female. Exactly like *D. sumichrasti* (one of Cresson's cotypes compared) except that it is somewhat larger, the scape is largely red, and the flagellum is partly red beneath, the color especially bright on the second joint and apex of the first. There is a strong contrast between the bright fox-red hair of the mesothorax and region about the tubercles, and the grayish-white of pleura. The abdominal bands are broad and bright ochreous. The mouth-parts are as follows: maxillary palpi 6-jointed, joints measuring in μ (1.) 224 (2.) 416 (3.) 464 (4.) 272 (5.) 176 (6.) 176; apex of second joint, and all of third, with a dense brush of hair on one side; last joint very slender; blade of maxilla about 2400 μ long, about 160 broad near middle, and about 352 near base; maxillary comb very well developed, with about 23 sharp teeth; paraglossæ linear, reaching to a little beyond middle of first joint of labial palpus; labial palpi with first joint about 1170 μ long and 192 broad, second 1010 long; third (arising laterally 160 μ from end of second) 176 long; fourth 160. Labrum about 1360 μ broad and 800 long, apex very obtusely angled, the apical margin with strongly fimbriate hairs.

Hab.—Baixa Verde, Rio Grande do Norte, Brazil (*Mann*). Six females.

The following list enumerates all the bees collected by Mr. Mann and his associates in Brazil.

Rio Grande do Norte.

(1.) Natal (*W. M. Mann & Heath*). June, 1911.

Xylocopa brasilianorum L.
" *branneri* n. sp.
Centris ænea Lep.
" *maculata* Lep.
" *lanipes* Fabr.
Exomalopsis paraguayensis manni n. subsp.
Megachile permunda n. sp.
Trigona amalthea Oliv.
" *ruficrus* Latr.
Dianthidium heathi n. sp.

(2.) Baixa Verde (*W. M. Mann*). June, 1911.

Megachile virescens n. sp.
Diadasia sumichrasti vulpihirta n. subsp.

Parahyba.

(3.) Independencia (*Mann & Heath*). Collecting was done in the hills north of the city. June, 1911.

Xylocopa grisescens Lep.
" *frontalis morio* Fabr.
Bombus kohli Ckll.
Centris libertatis n. sp.
" *bimaculata* Lep.
Augochlora diversipennis Lep.
Dianthidium heathi n. sp.
Ceratina maculifrons sm.
" *manni* n. sp.
Trigona ruficrus Latr.
" *amalthea* Oliv.
" *frontalis flavocincta* n. subsp.
Psœnythia canina n. sp.
Cœnonomada tertia n. sp.
Tapinotaspis heathi n. sp.
Diadasia parahybensis n. sp.
" *murihirta* n. sp.

Pará.

(4.) Pará (*Mann, Heath & Baker*). Most of the collecting was done in the suburb of Souza, along trails through the forest. July, 1911.

Xylocopa frontalis morio Fabr.
Oxæa festiva Sm.
Trigona recursa Sm.

Amazonas.

(5.) Manaos (*Mann & Baker*). On the Rio Negro. The bees were collected in a little meadow near the hacienda "Kete Purange." August, 1911.

Bombus cajennensis Fabr.
Xylocopa barbata Fabr.
Melissa maculata Friese.
Centris bimaculata Lep.
" *ceratocephala* n. sp.
Megalopta idalia Sm.
Ceratina chrysocephala n. sp.
Trigona clavipes Fabr.
" *amalthea* Oliv.
" *branneri* n. sp.
Melipona pseudocentris n. sp.
Tetrapedia plumipes Sm. (? = *ornata* Spin.)

(6.) Porto Velho (*Mann & Baker*). This is located seven kilometers north of the old native town, San Antonio, which is just below the lowest falls of the Madeira, State of Amazonas. September, 1911.

Megachile microsoma n. sp.
" *lenticula* Vachal.
" *curvipes* Sm.
" *brasiliensis* D. T.
" *flabellata* Vachal.
Coelioxys ardescens n. sp.
Euglossa cordata L.
Centris heterodonta n. sp.
Trigona fulviventris Guér.
" *guianæ* Ckll.
" *silvestriana* Vachal.
" *longipes* Sm.
" *manni* n. sp.
" *pellucida* n. sp.
" sp.

(7.) Itacoatiara (*Mann & Baker*). "The town is situated on the north bank of the Amazon, about forty miles below the mouth of the Rio Madeira. The bees were taken about some orchids, which had been brought aboard an anchored boat."

Euglossa cordata (L.)

MATTO GROSSO.

(8.) Abuná (*Mann & Baker*). "On the Rio Madeira nearly opposite mouth of Rio Abuná." September 1911.

Xylocopa viridis Sm.
Eulæma dimidata Fabr.
" *manni* n. sp.
Melissa decorata Sm.
Euglossa cordata L.
Melipona rufiventris Lep.
" *abunensis* n. sp.
Centris tarsata Sm.
Trigona pallida Latr.
" *manni* n. sp.
" *rhodoptera* n. sp.
" sp.

(9.) Madeira-Mamore R. R. Camp 41 (*Mann & Baker*). "Located on Rio Madeira 306 km. from Porto Velho." September 1911.

Euglossa cordata (L.)
Trigona rhodoptera n. sp.
" sp.

(10.) Madeira-Mamore R. R. Camp 43. (*Mann & Baker*). "On Rio Mamore 325 km. from Porto Velho." September 1911.

Megachile lenticula Vachal.
Centris bakeri n. sp.

The following abbreviations are used in the descriptions, in accordance with my usual custom: s. m., submarginal cell; r. n., recurrent nervure; t. c., transverso-cubital nervure; t. m., transverso-medial nervure; b. n., basal nervure.

THE STANFORD EXPEDITION TO BRAZIL, 1911.

J. C. Branner, *Chief.*

A NEW SAWFLY FROM BRAZIL.[1]

By S. A. Rohwer.

Mr. W. M. Mann has referred to me the sawflies and wood-wasps obtained in Brazil by the Stanford Expedition. They are as follows:

Sericocera gibba (*Klug*)

Female: Ceará, Brazil. (*Mann.*)

Manaos gen. nov.

Belongs to the Sterictiphorinæ and runs to couplet 31 in Konow's last table, to the genera of this group. The very narrow facial quadrangle will separate *Manaos* from related genera.

Slender species. Eyes large, extending almost to the anterior margin of the clypeus, converging to the clypeus; facial quadrangle narrow, much narrower than the length of the eyes; clypeus truncate, or nearly; palpi large; supraclypeal suture present, straight; frontal carina strong; antennæ inserted near the middle of face; ocelli in a curved line, the lateral ones tangent to the supraorbital line; posterior orbits very narrow; antennæ bifurcate in male; female unknown; tarsal claws simple; hind basitarsus longer than the following joints; fore wings: radial cell not appendiculate; four cubital cells, the basal three small, the second and third each receiving a recurrent vein near the base; basal vein remote from the origin of the cubitus; anal cell petiolate; transverse median received before the middle of the cell; hind wings: radial cell open; two discal cells; anal cell about the same length as the petiole.

Type.—*Manaos nigrinotatus* sp. nov.

Manaos nigrinotatus, sp. nov.

Male, Length 5 mm. Labrum narrowly arcuately emarginate; supraclypeal area convex; antennal furrows present, broad, shallow, nearly complete; ocellar basin oval in outline, more sharply defined near ocellus; postocellar furrow present, angulate from anterior ocellus; postocellar area not defined laterally; postocellar line subequal to the ocellocular line; hypopygium short, broadly rounded apically; stigma broad at base, tapering to a pointed apex; third cubital cell nearly quadrate. Testaceous; head above antennæ, meso- and meto-notum, tibiæ (except beneath), tarsi, apical three tergites and apical sternite black; clypeus, labrum, mandibles (except piceous apices) and base of venter pallid. Wings dark brown; venation black.

[1] Contribution from the Bureau of Entomology, Forest Insect Investigations.

Manaos, Brazil. One male collected by Mann and Baker. *Type.*—Cat. No. 14579, U. S. National Museum.

Ophrynopus batesianus Westwood.
Ophrynopus fulvistigmus Westwood.

Both from Porto Velho, Rio Madeira. (Mann & Baker.)

A PECULIAR NEW CRANE-FLY FROM PORTO RICO (*TIPULIDÆ; DIPTERA*).[1]

By Charles P. Alexander,

Ithaca, N. Y.

In some large collections of Neotropical crane-flies received for study from various sources, a peculiar form was discovered which can scarcely be placed in any of the described genera and the following new group is proposed for its reception:

Megistomastix gen. nov.

Antennæ (See fig. 1) very long, almost twice the length of the body; first segment cylindrical, short, the basal two-thirds smooth, the apical third on the dorsal aspect, with a broad depression; second segment short, irregularly cyathiform, the proximal side produced much farther cephalad than the distal side; third segment very elongate, at the base about two-thirds the diameter of segment two, rapidly narrowing to a diameter equal to one half of segment two, thickly clothed with long delicate hairs; segments four to thirteen, gradually decreasing in length, bearing the delicate hairs throughout. Rostrum without a nasus. Palpi short, none of the segments conspicuously longer than the others. Vertex produced forward into a short protuberence. Thoracic pronotum not conspicuous from above, the scutellum represented by a very narrow transverse piece; mesonotum rather depressed, the præscutum sub-circular, about as broad as long. Halteres long, stem slender. Legs long, femora shorter than the tibia; tarsi very long, twice the length of the femora.

Venation: Sc rather long, Sc_2 entering R_s just before the origin of R_s. R_1 rather long, ending opposite the fork of R_{2+3}. R_s, very short, transverse, shorter than the cross-vein *r-m*. R_{2+3} rather long, about one-third the length of R_3. R_2 leaves R_{2+3} at an angle of about 100°, its terminal section obliterated, represented by an indistinct spur at the junction of cross-vein *r*. Cross-vein *r-m*, long, longer than

[1] Contribution from the Entomological Laboratory of Cornell University.

the deflection of R_{4+5}. Cell 1st M_2 elongate, the sides parallel. M_{1+2} beyond the cross-vein *m*, short, about equal to the cross-vein *r-m*. Cu_1 meets M_3 at a point, barely obliterating the cross-vein *m-cu*. Cell Cu_1 broadest basally as in the Tipulinæ, Cu_2 being gently situnaed; 2d A rather short. Cells of the wings with sparse hairs, more numerous in the distal portion of the wing. Type and only known species, *M. portoricensis*, sp. nov.

This genus is referable to the tribe Dolichopezini. It agrees most closely with *Oropeza* and *Dolichopeza* but the antennæ, hypopygium and details of venation are quite different from these genera. It agrees to some extent, in the shape of the antennæ and the frontal tubercle, with *Macromastix* O. S., of Australasia and Chile; however it is only distantly related to this genus.

A Key to the Dolichopezini.

1. R_2 distinct for its entire length; antennæ with less than 13 segments; Male genitalia small, simple in structure.....2
   R_2 obliterated, at least on its terminal section; antennæ with 13 segments; Male genitalia complex in structure.....4
2. Antennæ long, filiform, or short; R_{2+3} perpendicular, simulating a cross vein; cross-vein *m-cu* present.....**Megistocera** Wiedemann
   (Asia, Africa and America; tropics)
   Antennæ short; R_{2+3} not perpendicular; cross-vein *m-cu* absent.....3
3. Head closely applied to the pronotum; 2d anal vein rather long
   Tanypremna Osten Sacken[1]
   (Cent. and South America; tropics)
   Head on a neck-like prolongation of the thorax; 2d anal vein short, running into the anal angle of the wing.....**Brachypremna** Osten Sacken
   (North and South America)
4. R_5 apparently lacking; if interpreted as being present, its basis much farther distad than its tip.....**Scamboneura** Osten Sacken
   (East Indies)
   R_5 present, but often short and simulating a cross-vein.....5
5. Cell 1st M_2 absent; basal deflection of Cu_1 proximad of the fork of M.
   Dolichopeza Curtis
   (Eur.; N. Am.; Australia)
   Cell 1st M present; basal deflection of Cu_1 distad of the fork of M.....6
6. Antennæ of male normal, short, with a few scattered hairs; cross-vein *m* tends to become obliterated; R_5, more elongate....**Oropeza** Needham
   (Eastern U. S.)
   Antennæ of male longer than the body, thickly clothed with long delicate hairs; cross-vein *m* prominent; R_5 short, transverse
   Megistomastix, gen. nov.
   (Greater Antilles)

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[1] *Tanypremna omissinervis* de Meijere (New Guinea) would run down to section A_2; it undoubtedly represents a new genus. I have a ♀ from Milne Bay, New Guinea. *Tanypremna fastidosa* Skuse (Australia) scarcely seems to be congeneric with the Neotropical forms; these species need further study.

Megistomastix portoricensis sp. nov.

Male. Antennæ elongate; color light brown; pleuræ paler; legs brown.

Length 5 mm.; wing 7.5 mm.; antennæ 9.5 mm.; fore leg, femur, 5 mm.; tibia, 6.5 mm.; tarsus, 10.6 mm.

Vertex produced cephalad into a triangular tubercle; on the sides, at the inner angle of the eye, a shallow depression. Antennæ light brown, the flagellar segments darker brown, the long flagellar hairs black. Vertex light brown, with a yellowish median line; front internally light gray, a narrow median brown line extending from the cephalic margin of the vertex forwards; front between the antennæ and inner margin of the eye, light brown; genæ and occiput brown. Rostrum and palpi light yellow, palpal segments three and four, darker brown.

Thorax: prothoracic scutellum light, whitish-yellow; mesonotal præscutum light brown, with indistinct spots of darker brown, the lateral and cephalic edge of the sclerite pale whitish-yellow; scutum, scutellum and postnotum uniform medium brown. Pleuræ light brown with an oblique pale stripe extending from near the mesothoracic spiracle to above the mesocoxa. Halteres pale, knob brown. Legs: coxa and trochanters light yellow; femora external face with a light yellow basal streak, rest of the femora and the tibia and tarsi dark brown.

Abdomen: targum, basel two segments light yellowish-brown; remainder dark brownish-black; hypopygium light yellow; sternum paler brown.

Wings: light grayish-brown; stigma large, square, occupying most of cell 1st R_1 and the distal end of cell *C;* a brown furrow-like mark in under *Cu.* Venation (see generic characterization) as in fig. 2.

Genitalia: 6th and 7th sternites projecting, sheath-like, beyond the basis of the following segment; hypopygium not prominently exserted. Hypopygium (see fig. 3). Suture between sternite and tergite of the 9th segment not very distinct; sternal region (e) produced caudally into a lobe which is broadly and roundly emarginated on the ventral aspect, the whole of this projection being clothed with long hairs; tergal region narrow, deeply emarginate, the inner arm (a) bearing a caudad-projecting appendage (b); the ventral or outer arm (c) is more slender and bears three teeth on its inner margin; below this and nearer to the sternal margin is an appendage (d) which is pseudo-segmented; a large pale organ, brown at the tip, projects from the dorsal portion of the genital chamber. The figure is drawn from the unique type and is somewhat compressed under glass.

Holotype—Male, El Yunque, Porto Rico; 2800 ft.; Feb. 20, 1900. C. W. Richmond, collector. (Coll. U. S. Nat. Mus.; Access, No. 14,592).

It is barely possible that the *Megistocera brasiliensis* Wiedemann (Aussereuropäische Zweiflügeligen Insekten, I; p. 554; pl. VI b.; fig. 13, antenna; 14 wing.) is referable to this new genus. The species is stated by Osten Sachen to be nearly related to *Pachyrhina* Macquart (See Osten Sacken, Studies on Tipulidæ, p. 241; Berliner Ent. Zeitschr., XXXI; [1887]; Pt. 2).

I wish to state my indebtedness to Dr. Frederick Knab for the kind loan of the extensive collections of the National Museum. My thanks are due to Dr. J. Chester Bradley and Dr. James G. Needham for frequent advice on difficult questions.

OBSERVATIONS ON *MICOUTALIS CALVA* SAY.

By Ignaz Matausch,

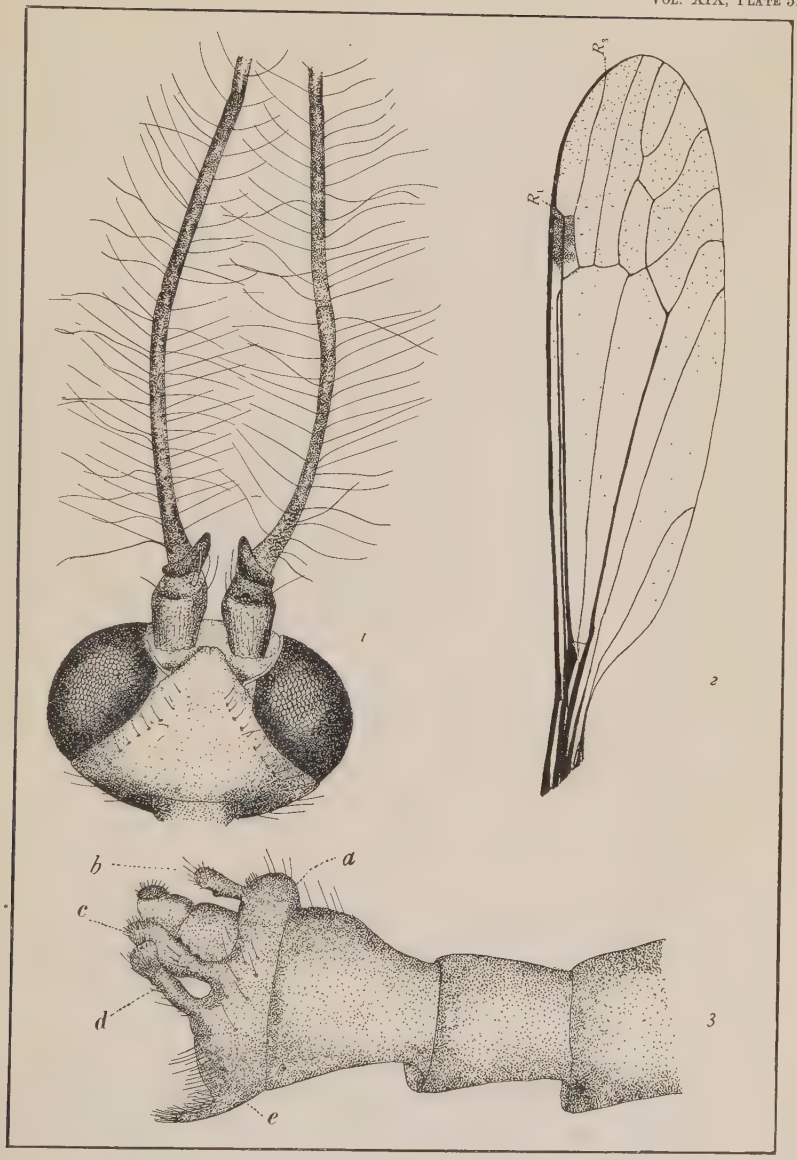
Roselle, N. J., 1911.

Two years ago, on September 26, I found the first insect of this species, a female, near Irvington, N. J. Last year I did not see a single one, but this season, on August 20, while examining an elder bush near Roselle, N. J., for a larger genus (*Acutalis*), I found two very small insects like it, but of a considerably smaller size, which proved to be *Micoutalis;* one of these I captured, but the other escaped.

While hunting around that bush, where numerous ironweed-plants (*Vernonia noveboracnsis*) had been in full bloom, I found one very small nymph belonging, as I saw, to a small kind of *Membracidæ*. Soon afterward I found more of these nymphs, and at the same time more of the adult insects of *Micoutalis*. I thought they probably were the nymphs of that species, and to make sure I collected a number which I succeeded in rearing, as all (with the exception of one which died) were in the last nymphal stage. They matured, and both sexes have been obtained; on August 22d, the first, a male; on 23d a female; on 24th another female; on 26th more males and females. On this last day the plant wilted, and on the 28th all died.

On September 3, when the plants in the field began to wither, I collected two more nymphs which matured, one on September 11 and the other the following day, both females. On September 4 I found one soft nymph, of a brilliant yellow-red color, just after the change from the preceding stage into the last nymphal stage; but its bright color did not last, and after about one hour turned to a yellowish-red brown.

They seem to be very delicate, for after being handled in that



ALEXANDER—*MEGISTOMASTIX*

condition the insect died the next day. Whether these insects have this bright color, after each molt, as does *Euchenopa binotata* (which are at first always of yellow and red), I cannot state, but they probably do.

On September 15 a frost set in and on the 17th only very scattered blossoms were found and the plants began to dry. At this time only one nymph was collected which matured on September 22 into a splendid female. After that time none were found until October 8, when only a few smaller plants were partly green; then I discovered one nymph of which I made a water-color picture

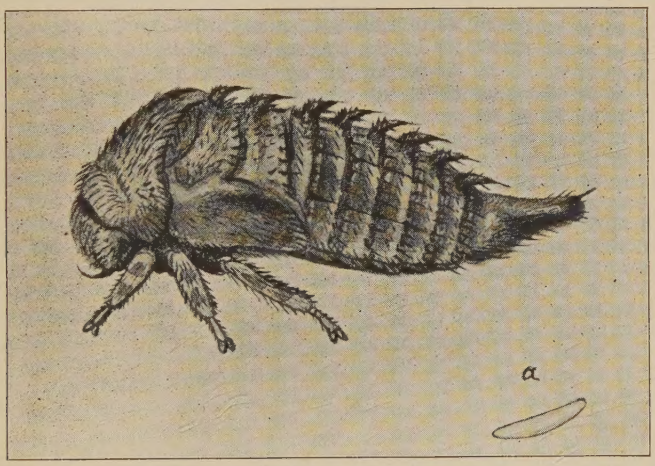


Fig. 1. Nymph and egg of *Micoutalis calva* Say.

on the 12th of October. By supplying a fresh plant I found it fully developed on October 14.

After that I could not find any food plant in nursing condition so I tried *Trifolium pratense* and *T. hybridum*. The insect was kept on those plants till December 3 when I found it dead, fastened to the stem with its sucking bristles. The figure shows the nymph in the stage before maturity; they are nearly equal to the adult in size and vary somewhat according to the sex; averaging 3.5 mm. in length. In color some are dull green, others yellowish-brown, or red-brown; but the majority are purple, the exact color of the stems toward the upper parts of the plants. Before trans-

forming into the adult they fasten themselves by means of their piercing mouthparts often near or on the bud of the flower, as I found quite a number of shed skins at these places.

Metamorphosis takes place usually very early in the morning as on my morning examinations I always found the insects in their adult stage in full color, although in one instance when I collected on September 4 a male of a somewhat grayish-white, which soon became yellow, then passed through brown into black in a little less than half an hour. It is a very lively insect as an adult; but the nymphs hardly move, as I found them resting all the time on the thinner stems near the flowers, always with the head directed downwards. This habit is also most frequently characteristic of the adult, as I noticed on September 4 when I was vainly watching them for some time, in hopes of observing one in the act of oviposition.

The adult male insect is about 3.2 mm. in length, the female 3.6 mm., and the colors as well as the pattern vary considerably in both sexes. I found in one case a male with the whole prothorax, except the humeral angles, shining black. In case of one female the lateral marginal markings were absent, while in another the anterior pair of legs of the femora were light brown. The claws in living specimens are bright green. The abdomen varies from bright green in some specimens, through all shades to bright yellow, usually mixed with more or less bright red dorsally. The pygofer is always green, a little blackish at the apex in the male; in the female the ovipositor is sometimes green but generally black, the black often extending along the side of the ovipositor and forming an oval marking.

On August 20 and on the following day both sexes were collected, the males in greater number. On September 3 and 4th I collected 7 females and 5 males. On September 17 only females were found, of which two were collected for observation. One died on September 26 and the other was killed and both examined for eggs; one containing 9, the other 13. On September 24 three other females were captured for the same purpose, the first dying on October 5 containing only 3 eggs, the second on October 14 containing 9 and the third on the 19th when 11 eggs were found; in the insect I kept in captivity till December 3 I found 10 eggs. On October 1 I did not succeed in finding a single insect, but on

the 8th of this month in addition to the above mentioned nymph, the last adult insect was seen.

The eggs are green or yellowish-green in color, measuring about 0.7–0.8 mm. in length, 0.2 mm. in width, slightly curved in shape, and almost equally pointed on both ends. Fig. a.

As I could not find any of the females in the act of ovipositing although I examined all the plant parts where females were seen resting, and then after having kept the females so long in captivity without any egg being deposited, I doubt whether the insects lay their eggs in the food plant. They may do as I have observed in the case of *Campylenchia curvata* which feeds on *Solidago* and is found depositing its eggs on *Vernomia*.

THE PERIOD OF INCUBATION OF THE EGGS OF *SAMIA CECROPIA*.

During the spring of 1911 it was found convenient to gather data on the relation of each day's deposit of Cecropia eggs to their period of incubation.

The table on p. 70 shows the number of days required for the hatching of the eggs of each of 36 females for the 1st, 2d, 3d, 4th, 5th, 6th, and 7th day's deposit. Queries indicate that the eggs did not hatch at all.

The periods recorded are counted from the days when the great majority of each day's lot hatched. In some instances a small part of the caterpillars emerged a day earlier, and in a few other cases a few stragglers were observed later.

The table clearly shows that the period of incubation of the eggs deposited between May 16 and June 26 varied from 6 to 11 days, the great majority being 8 or 9 days. The table also shows that the period of incubation is practically the same for each day's deposit; first or last oviposition does not seem to cause the period of incubation perceptibly to vary.

We see a few periods of 10 days and one of 11 days occurring during the early experiments, but possibly climatic conditions at that season can account for this prolonged time.

St. Louis, Mo., February 14. Phil Rau.

♀ No.	1	2	3	4	5	6	7	Date of first day's deposit
1	10	?	?	.....	.....	.....	.....	5–19
2	10	9	?	.....	.....	.....	.....	5–16
3	?	?	10	.....	.....	.....	.....	6–9
4	11	?	9	10	.....	.....	.....	6–9
5	?	?	9	.....	.....	.....	.....	6–9
6	9	9	10	9	10	.....	.....	6–10
7	9	?	.....	.....	.....	.....	.....	6–11
8	?	9	.....	.....	.....	.....	.....	6–10
9	?	9	.....	.....	.....	.....	.....	6–10
10	7	8	8	.....	.....	.....	.....	6–11
11	9	9	?	.....	.....	.....	.....	6–11
12	9	9	9	9	9	10	.....	6–11
13	9	9	9	.....	.....	.....	.....	6–16
14	9	9	9	10	.....	.....	.....	6–14
15	9	8	7	8	.....	.....	.....	6–15
16	9	9	8	8	8	.....	.....	6–17
17	9	8	8	9	.....	.....	.....	6–18
18	?	?	?	?	6	7	.....	?
19	8	8	?	?	8	.....	.....	6–21
20	9	9	9	10	9	9	9	6–21
21	8	8	8	9	8	.....	.....	6–21
22	9	?	9	7	.....	.....	.....	6–22
23	9	9	9	9	9	.....	.....	6–22
24	8	8	8	.....	.....	.....	.....	6–22
25	?	8	7	.....	.....	6	.....	6–23
26	?	8	9	.....	.....	.....	.....	6–23
27	?	?	?	6	.....	.....	.....	6–23
28	8	8	8	8	.....	.....	.....	6–23
29	8	8	8	6	.....	.....	.....	6–23
30	?	8	?	8	.....	.....	.....	6–23
31	?	8	9	9	.....	.....	.....	6–23
32	8	9	9	.....	.....	.....	.....	6–24
33	8	9	8	.....	.....	.....	.....	6–24
34	8	8	8	.....	.....	.....	.....	6–25
35	8	?	.....	.....	.....	.....	.....	6–26
36	8	?	.....	.....	.....	.....	.....	6–26

Queries indicate that the eggs failed to hatch.